Using Computer Simulation for Reducing the Appointment Lead-Time in a Public Pediatric Outpatient Department

Ortiz-Barrios, M., Jiménez-Delgado, G., McClean, S., Polifroni-Avendaño, G.

Abstract

Pediatric outpatient departments aim to provide a pleasant, effective and continuing care to children. However, a problem in these units is the long waiting time for children to receive an appointment. Prolonged appointment lead-time remains a global challenge since it results in delayed diagnosis and treatment causing increased morbidity and dissatisfaction. Additionally, it leads to an increased number of hospitalization and emergency department visits which augments the financial burden faced by healthcare systems. Despite these considerations, the studies directly concentrating on the reduction of appointment lead-time in these departments are largely limited. Therefore, this paper proposes the application of Discrete-event Simulation (DES) approach to evaluate potential improvement strategies aiming at reducing average appointment lead-time. Initially, the outpatient department is characterized to effectively identify the main activities, process variables, interactions, and system constraints. After data collection, input analysis is conducted through intra-variable independence, homogeneity and goodness-of-fit tests followed by the creation of a simulation model representing the real pediatric outpatient department. Then, Mann-Whitney tests are used to prove whether the model was statistically comparable with the real-world system. After this, the outpatient department performance is assessed in terms of average appointment lead-time and resource utilization. Finally, three improvement scenarios are assessed technically and financially, to determine if they are viable for implementation. A case study of a mixed-patient type environment in a public pediatric outpatient department has been explored to validate the proposed methodology. Statistical tests demonstrate that appointment lead-time in pediatric outpatient departments may be meaningfully minimized using this approach.

Keywords:

Appointment lead-time, Discrete-event simulation (DES), Healthcare, Outpatient care, Pediatric